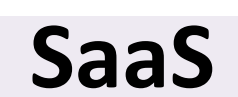


Cloud Service Provider (CSP)



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Pros:

- 1) Easy to setup
- 2) Least expensive option

Cons:

- 1) No quality of service
- 2) Prone to latency and degradation
- 3) No capacity reports
- 4) Difficult to troubleshoot

A VPN or Virtual Private Network is a method used to add security and privacy to private and public networks, like WiFi Hotspots and the Internet. VPNs are most often used by corporations to protect sensitive data. Security is the main reason why corporations have used VPNs for years. The most common VPN protocols are: 1) PPTP tunnels a point-to-point connection over the GRE protocol. PPTP security is strong, but not the most secure. 2) L2TP/IPsec - L2TP over IPsec is more secure than PPTP and offers more features. L2TP/IPsec is a way of implementing two protocols together in order to gain the best features of each. In this case, the L2TP protocol is used to create a tunnel and IPsec provides a secure channel. This makes for an impressively secure package. 3) Open VPN - OpenVPN is an SSL-based VPN that continues to gain popularity. The software used is open source and freely available. SSL is a mature encryption protocol, and OpenVPN can run on a single UDP or TCP port, making it extremely flexible.

<https://www.whatismyip.com/what-is-a-vpn/>

Pros:

- 1) Secure
- 2) Dedicated bandwidth
- 3) QOS

Cons:

- 1) Limited to one provider
- 2) Expensive

Multiprotocol Label Switching (MPLS) is a protocol for speeding up and shaping network traffic flows. MPLS allows most packets to be forwarded at Layer 2 (the switching level) rather than having to be passed up to Layer 3 (the routing level). Service providers can use MPLS to improve quality of service (QoS) by defining label-switched paths (LSPs) that can meet specific service level agreements (SLAs) on traffic latency, jitter, packet loss and downtime. For example, a network might have three service levels -- one level for voice, one level for time-sensitive traffic and one level for "best effort" traffic. MPLS also supports traffic separation and the creation of virtual private networks (VPNs) virtual private LAN services (VPLS) and virtual leased lines (VLLs).

<http://searchenterprisewan.techtarget.com/definition/Multiprotocol-Label-Switching>

Pros:

- 1) One MPLS circuit with connections to multiple Cloud Service providers
- 2) Can be configured to support multiple agencies
- 3) Dedicated bandwidth with QoS
- 4) Good report options

Cons:

- 1) None noted

VITA has Verizon SCI on contract as well as a couple broadband providers.

Can add to CenturyLink contract but their exchange has limited partners.

Cloud Exchanges are a breed of service providers also known as cloud brokers. A broker can be an external or internal entity that acts as an intermediary between cloud service providers and customers. Brokers can manage and simplify multiple contractual relationships between suppliers and consumers, and customize certain aspects of a cloud service being delivered to a customer in order to map more closely to users' requirements.

<http://searchtelecom.techtarget.com/tip/Will-the-cloud-exchange-be-the-next-big-ecosystem-player>

Cloud Exchanges connect your cloud services seamlessly:

Interconnect multiple providers with no additional resources.

Create a secure entry point into your cloud ecosystem.

Control costs.

Create redundancy for cloud resources.

Assign cloud resources as needed.

Allows inter-connecting virtual machines (VM's) configured on different cloud service provider (CSP) platforms and/or between different regions of the same CSP.

Verizon's Secure Cloud Interconnect (SCI): Lets you connect to a global ecosystem of public cloud service providers and applications.

Direct connection to leading cloud providers.

Pre-provisioned access to cloud resources.

Scalable bandwidth.

Usage-based and data-plan pricing options.

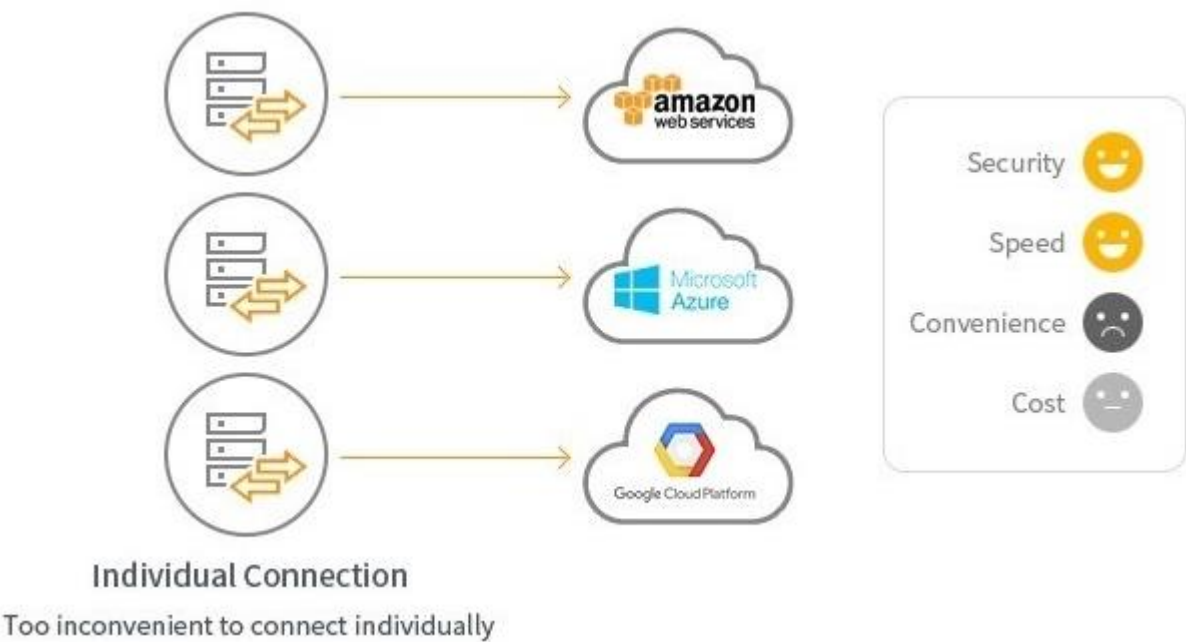
Mobile/LTE connectivity.

Premium performance with QoS.

Management from a single protal.



CESSC to CSP
Site-to-Site VPN Tunnel



CESSC to CSP
MPLS Circuit



CESSC to CSP
Cloud Exchange

Enterprise Cloud Oversight Services (ECOS)



Description: Enterprise Cloud Oversight Service (ECOS) provides oversight functions and management of cloud based services, specifically focused on software as a service (SaaS). The service assures compliance and improved security by providing transparency through VITA oversight. The service assures consistent performance from suppliers through service level and performance monitoring. Agencies benefit from flexibility with growing business demands by ensuring adequate security controls are in place for the protection of data, proper utilization of resources and compliance with regulations, laws and timely resolution of audit recommendations. ECOS minimizes the need for exceptions in obtaining external SaaS services. ECOS provides a flexible and custom option for obtaining SaaS services which meet the specific needs of the agency.

The service offers guidance and oversight activities for agencies in the following areas: 1) Meeting commonwealth requirements, such as SEC 501 and SEC 525, 2) Incorporating appropriate contract terms and conditions to mitigate risk, 3) Completing Annual SSAE18 assessment reviews, 4) Ensuring vulnerability scans and intrusion detection are conducted, 5) Patching compliance of suppliers environment, 6) Ensuring architectural standards are met, 7) Monitoring performance against Service Level Agreements (SLAs).

ECOS is a service specifically created for third party vendors offering software as a service (SaaS) applications.

ECOS Applies when: 1) Services under procurement meet the above definition and/or characteristics of a SaaS provider. 2) When an agency is requesting the provider to act on behalf of a Commonwealth entity and/or is accepting commonwealth data, and/or serving as the data custodian and/or system administrator of that data for purposes of making it available back to the Commonwealth via an interface for fee.

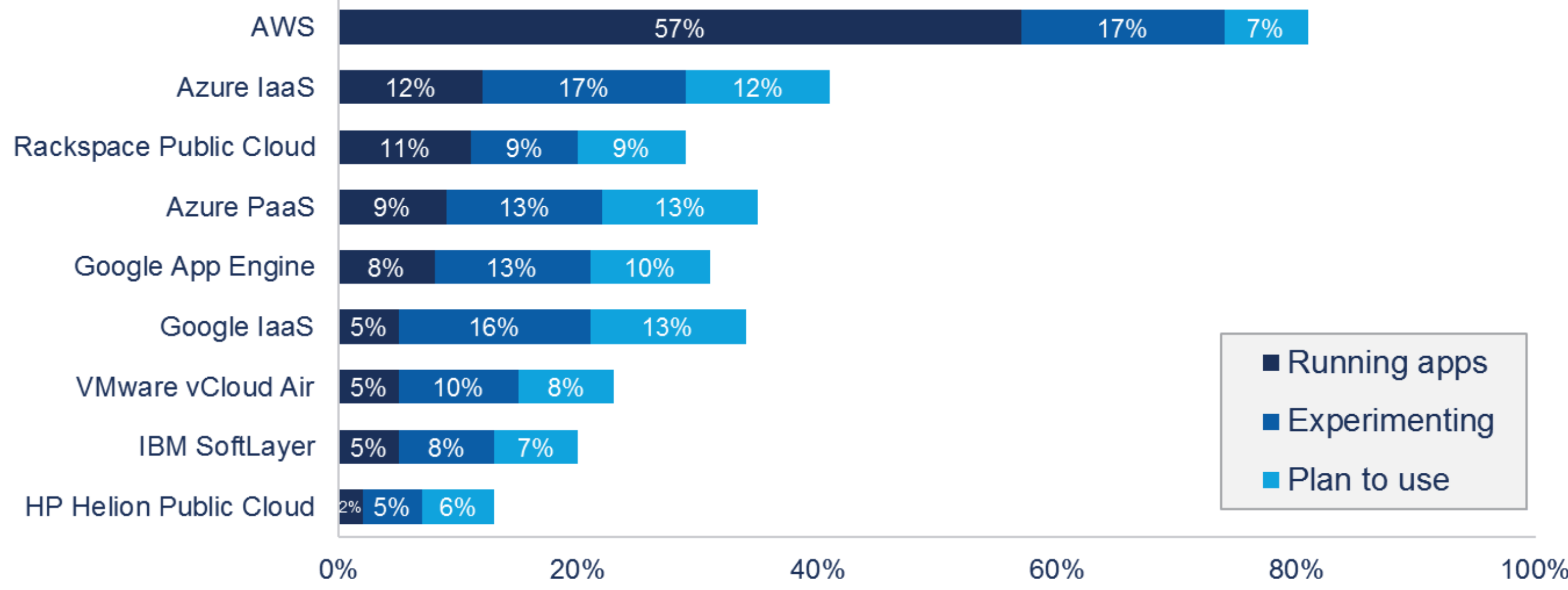
ECOS is composed of 3 component services under the cloud oversight umbrella:

1. Assessment Review*: The assessment component is a pre-procurement questionnaire that will be completed by the proposed supplier(s) and reviewed by the Enterprise Services Director and the Security Architect.
2. Supply Chain Management Consulting Service (SCM)**: The SCM component includes consulting services to offer guidance and oversight to the agencies for delegated cloud procurements, including contract language, contract terms and conditions, support during negotiations, and SCM final contract review. The SCM Consulting Service assures that contract language embedded into cloud contracts enable VITA oversight.
3. Cloud Services Oversight: The oversight component provides monthly performance monitoring (PM), Service Level Agreement (SLA) management, operational oversight and security conformance of SaaS services through analysis and review of data and artifacts provided by the SaaS service supplier. The service assures compliance with regulations, laws and annual audit recommendations.

<http://shop.vita.virginia.gov/ProductDetail.aspx?id=6442475853>

Public Cloud Usage

% of Respondents Running Applications



Source: RightScale 2015 State of the Cloud Report

* Service Comparison Table

Items	Using Individual Dedicate Lines	Using Cloud Hub	Using general internet service
Multi-Cloud	Suitable	Suitable	Unsuitable
Application Process	Need to inquire each providers	Intergrated support from KINX	Configure individually
Line management	By each provider	With a single line	Not available
Cost	Cross- Connect cost for each services + Private cloud transmission cost (High)	Cloud Hub cost + Private cloud Transmission cost (Low)	Internet fee (High) + Cloud transmission cost (High)
Transmission Performance (Throughput, Latency)	Stable & High quality	Stable & High quality	Depending on Internet environment
Security	Safe (dedicated line)	Safe (dedicated line)	Weak (Public Internet environment)

'Cloud Hub' enables access to Multi-Cloud and even various services and solutions, over a single connection.

